PHOTO ALBUM - I

FOREST INSECT RESEARCH, SURVEYS, AND CONTROL IN OREGON AND WASHINGTON

1. Survey Methods

2. Spruce Budworm

Prepared by

Pacific Northwest Forest and Range Experiment Station
Forest Service
U. S. Department of Agriculture

This high-wing airplane, Cessna 180, used for aerial surveys and aerial survey techniques research, has good visibility and adequate performance over mountainous terrain.

Survey crew in position for sketch mapping forest insect infestations. (Door removed to show details.)

Aerial surveys are a rapid and effective method of detecting and evaluating forest insect outbreaks. Annually since 1949, aerial surveys have been made of 48,000,000 acres of forest land in Oregon and Washington.

Sketch mapping is the principal method used. It is particularly suited for delineating defoliator outbreaks, as with the spruce budworm and orienting salvage operations of bark-beetle-killed trees. For special purposes, such as evaluating chermes damage, aerial photographic sampling provides quantitative data that cannot be obtained by sketch mapping.

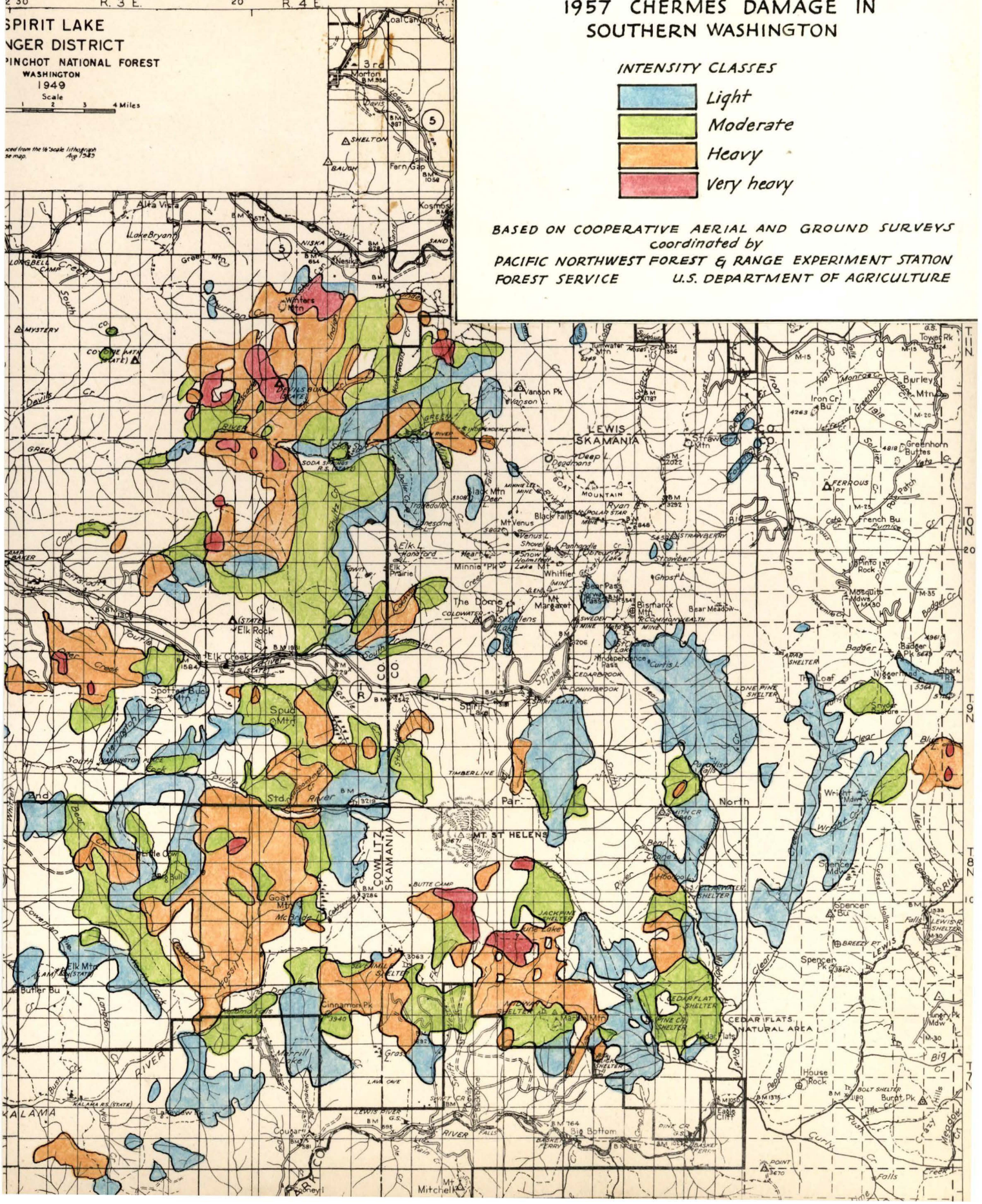
The above photograph shows a survey plane on a sketch mapping mission in Oregon. The groups of red trees were killed by the Douglas-fir beetle.

1957 CHERMES DAMAGE IN SOUTHERN WASHINGTON

INTENSITY CLASSES

- Light
- Moderate
- Heavy
- Very heavy

BASED ON COOPERATIVE AERIAL AND GROUND SURVEYS
coordinated by
PACIFIC NORTHWEST FOREST & RANGE EXPERIMENT STATION
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

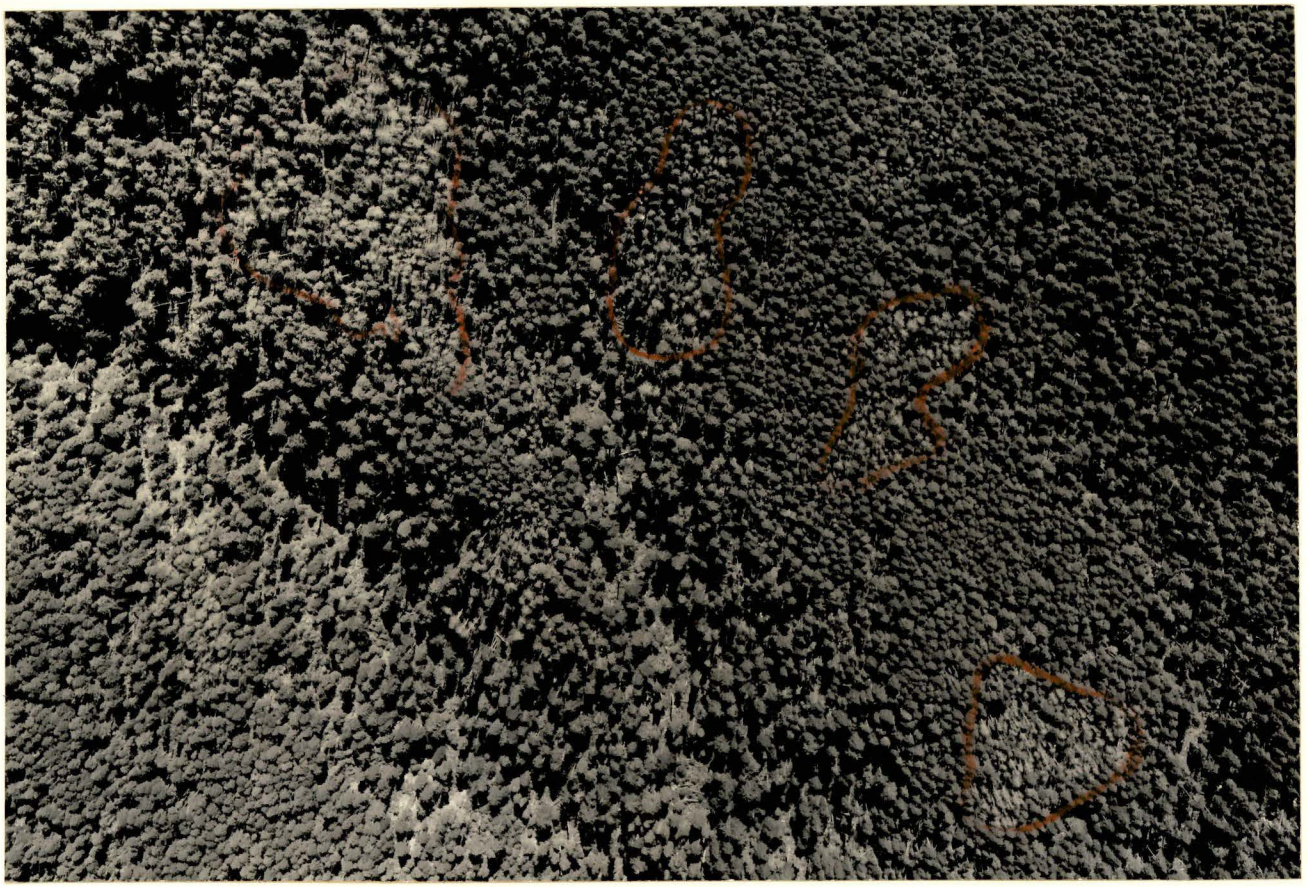


AERIAL PHOTOGRAPHIC SURVEY - TECHNIQUES RESEARCH

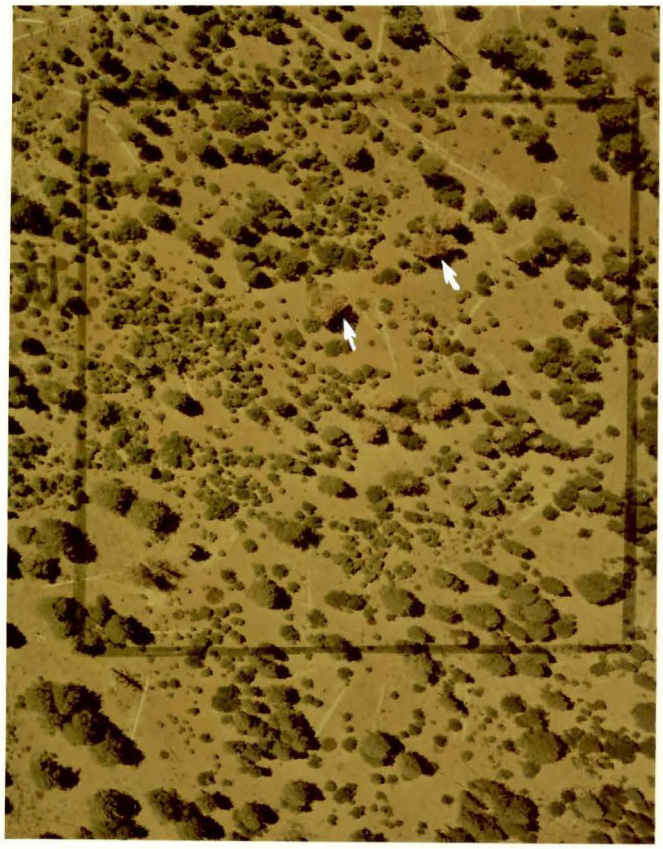
Development of aerial survey techniques requires a team of experts working with special equipment and facilities.

Left - Photographer in position to operate aerial camera.

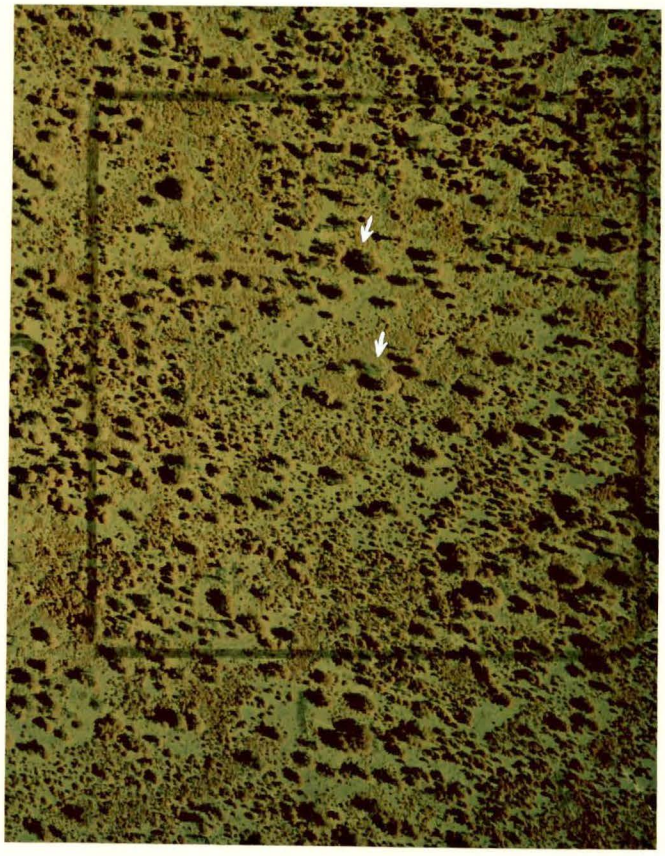
Below - Portion of aerial photo used to locate and evaluate damage by the Douglas-fir beetle. The areas circled in red are groups of beetle-killed trees.



AERIAL PHOTOGRAPHIC SURVEY TECHNIQUES RESEARCH



Dead trees are reddish-brown



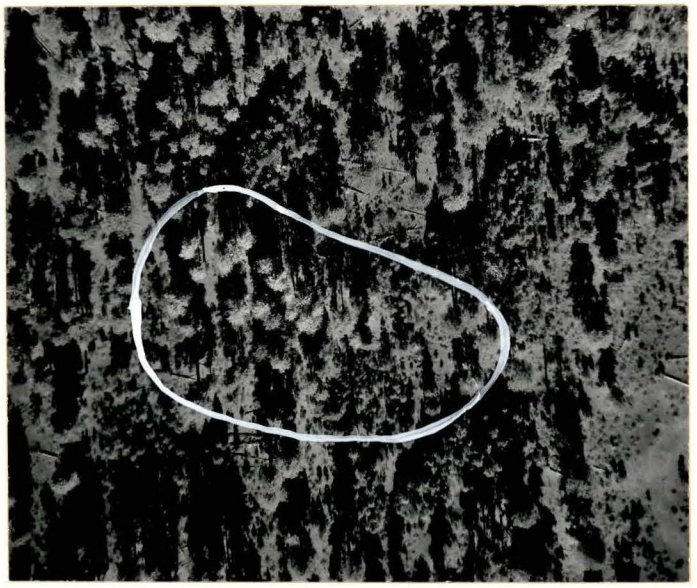
Dead trees are green

Aerial photographs on color film (left) and camouflage-detection film (right) show a ponderosa pine stand with mortality caused by the western pine beetle. Through studies using photographs such as these, methods have been developed for combining photo interpretation and field checking to obtain estimates of mortality caused by certain forest insects. At its present stage of development, the technique can be expected to provide an appraisal of the loss due to epidemics of the Douglas-fir bark beetle or western pine beetle at less cost than a field survey of comparable accuracy.

AERIAL PHOTOGRAPHIC SURVEY TECHNIQUES RESEARCH

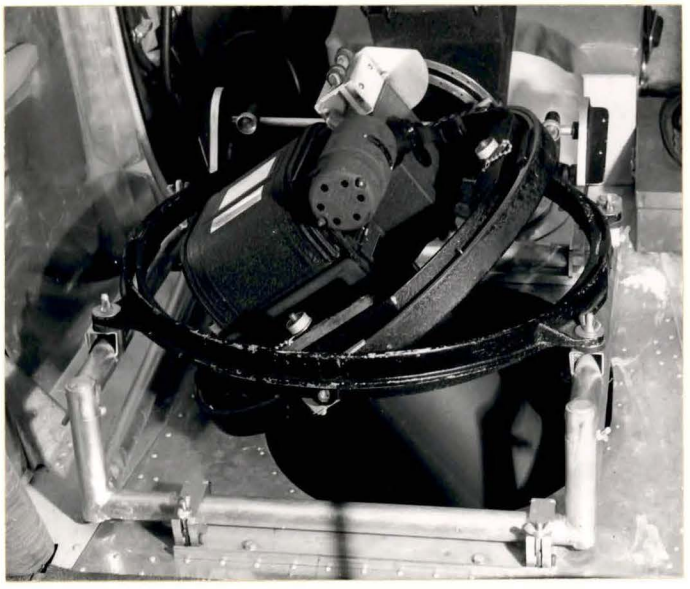
Aerial color photograph of Pacific silver fir killed and damaged by the balsam woolly aphid. Photographs of this type can be used as an aid in appraising the losses caused by this insect, currently the most damaging in the Pacific Northwest. The technique has been tested on a survey of 400,000 acres around Mount St. Helens, Wash., where the heaviest damage is concentrated.

AERIAL PHOTOGRAPHIC SURVEY - TECHNIQUES RESEARCH

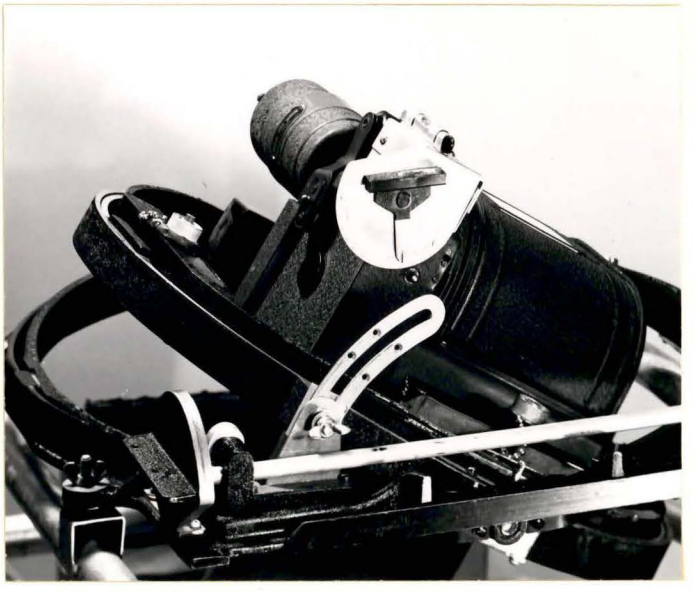


Vertical aerial photograph of old-growth ponderosa pine stand showing trees which appear to be killed by western pine beetle.

30 degree oblique of same group showing that attacked trees are only top-killed. Oblique photography promises to increase interpretation accuracy in ponderosa pine type, and may apply to other forest types.

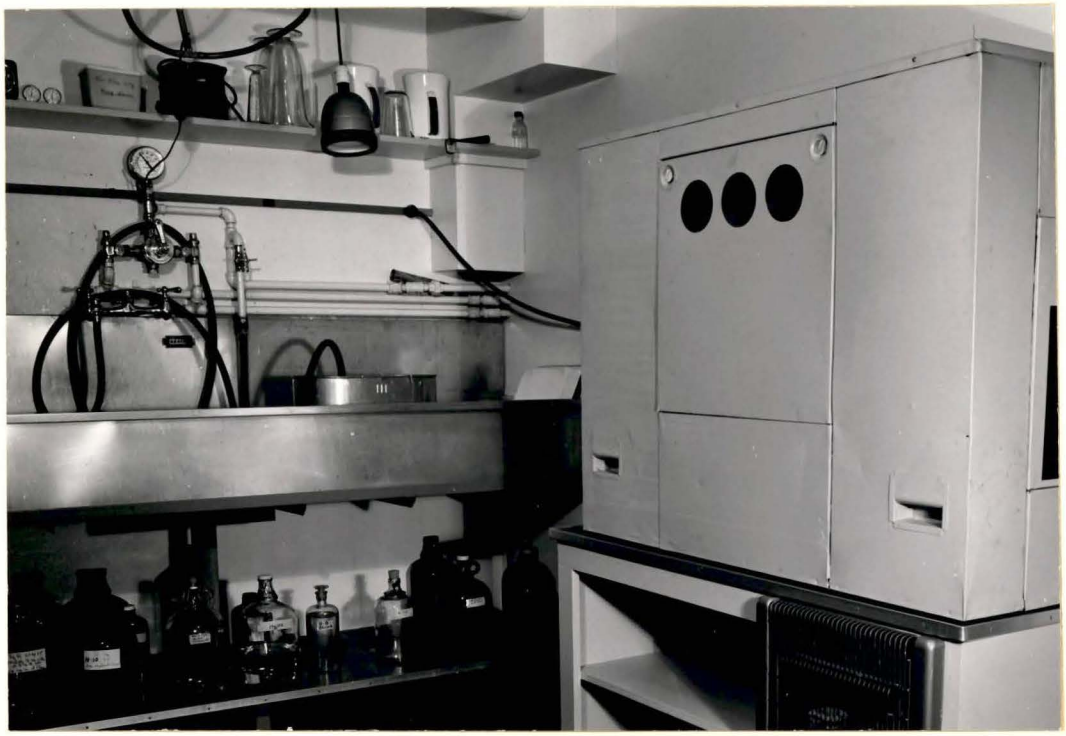


Modified camera mount accommodates standard aerial cameras for oblique Photography ranging from 0-40 degrees from the vertical. Camera mount has simple extension for long focal length cameras.



Oblique leveling system for each aerial camera provides a means to regulate the angle of oblique photography.

AERIAL PHOTOGRAPHIC PROCESSING FACILITIES



Tempered water unit, special processing tanks, and roll film dryer are necessary in processing color and monochrome aerial films.

Quality research prints are obtained with maximum efficiency in this well planned processing room.

SURVEYS - BIOLOGICAL EVALUATION

After insect outbreaks are located, they are studied to determine whether chemical control is necessary. Methods of evaluation vary widely by insects.

Left - Entomologists counting eggs to forecast the severity of a black-headed budworm outbreak the following year.

Below - Cages to force emergence of hibernating larvae of the spruce budworm to provide population information for control planning.

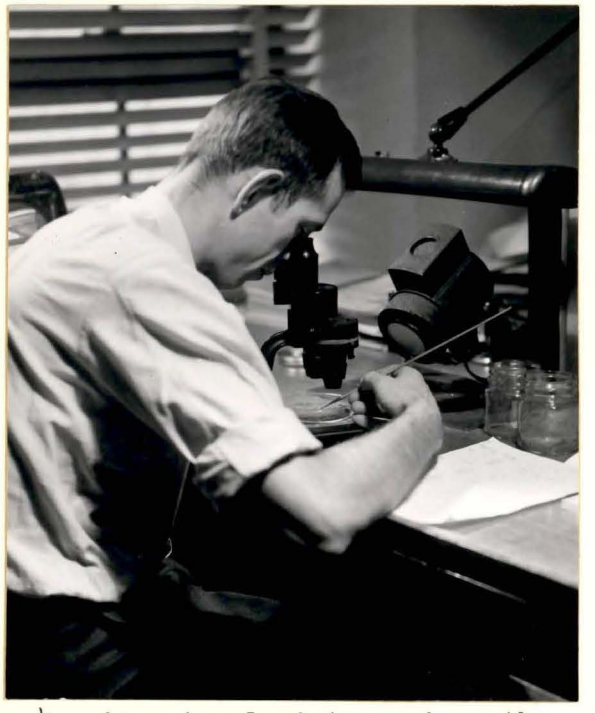
SURVEYS - BIOLOGICAL EVALUATION

A mechanized procedure greatly facilitates sampling hemlock looper populations in the egg state. The eggs are laid on lichens on tree trunks.

1. Standard samples of lichen are collected, dried, and pulverized.

2. Screenings reduce bulk of the samples but retain the eggs.

3. An aspirator further concentrates the sample. Viable eggs in smaller pile.



4. An entomologist examines the concentrate, and counts the looper eggs.

CONTROL PLANNING

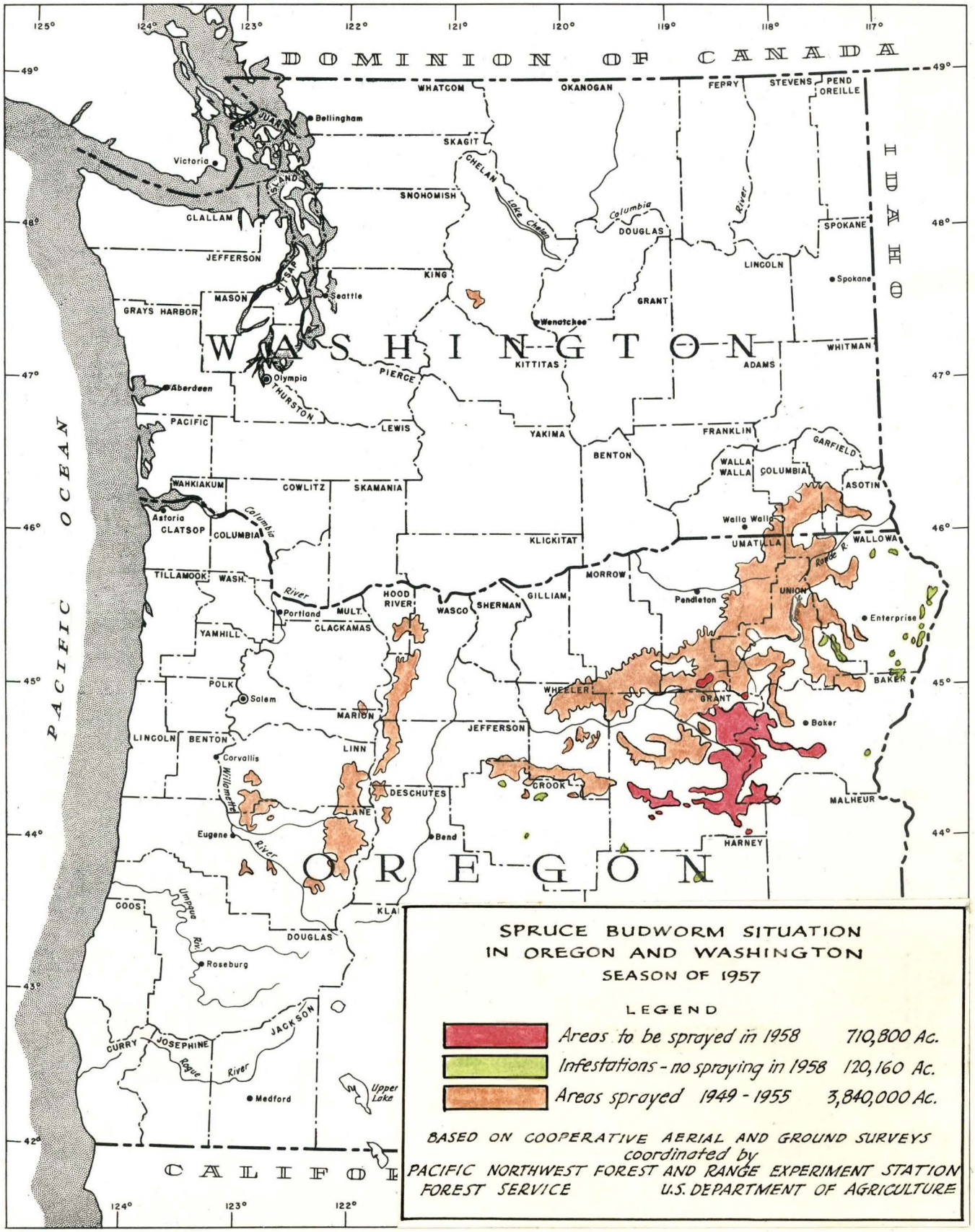
Members of the Northwest Forest Pest Action Council discussing plans for spruce budworm control. Through this council, private, state, and federal agencies have united to control the spruce budworm and other forest pests in Oregon and Washington.

Helicopter used to test effect of low-level application of DDT.

Cloth tray used to catch and measure larvae following experimental spraying.

RESEARCH - Successful experiments in 1948 in Oregon, culminated years of cooperative effort in the United States and Canada, to find a practical method of budworm control. Methods developed during this experiment have been used throughout the Oregon-Washington control program.

Research has continued to: (1) Increase effectiveness of spraying, (2) reduce costs of control, and (3) measure effectiveness of natural enemies of the budworm.



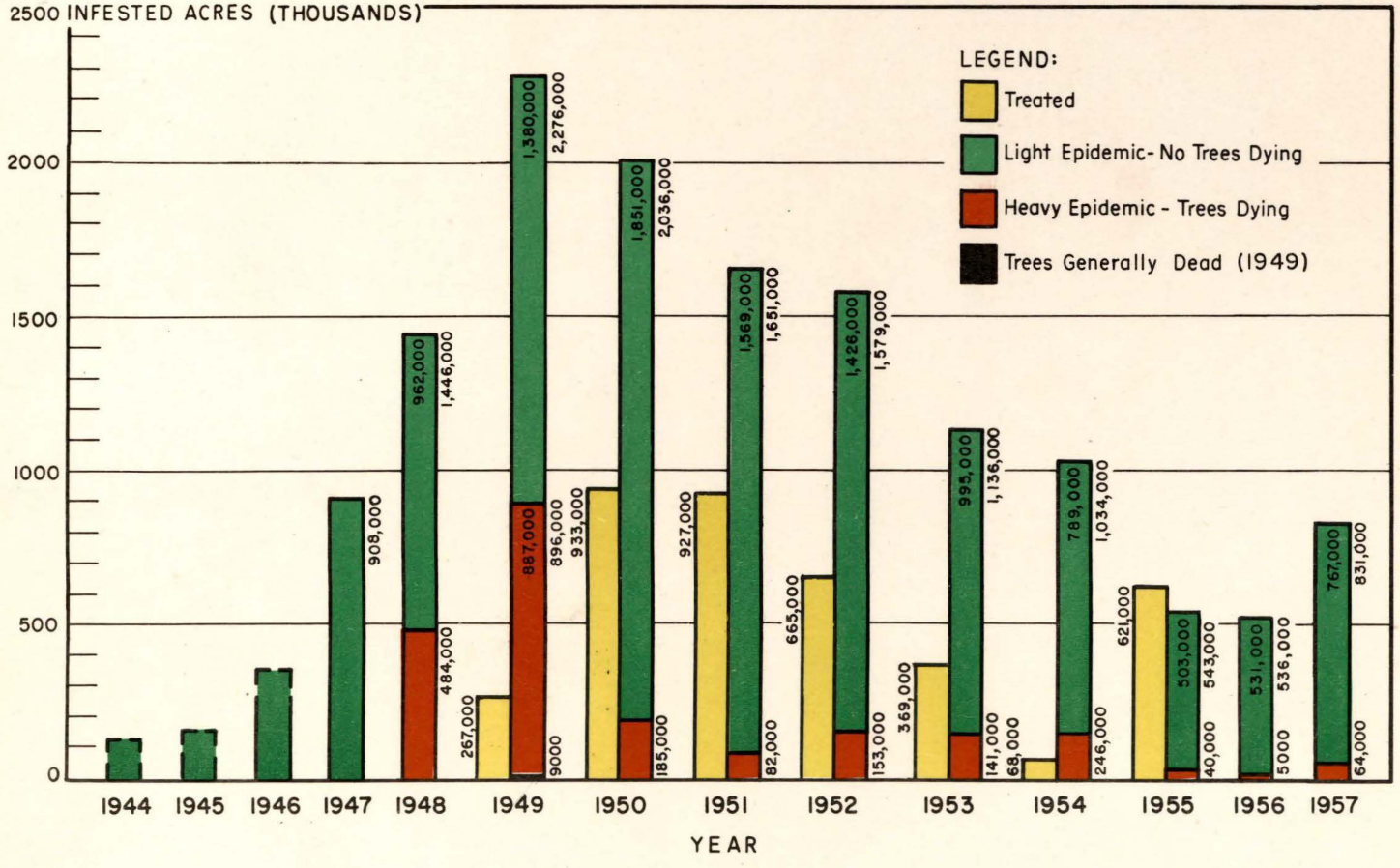
SPRUCE BUDWORM SITUATION IN OREGON AND WASHINGTON SEASON OF 1957

LEGEND

Areas to be sprayed in 1958	710,800 Ac.
Infestations - no spraying in 1958	120,160 Ac.
Areas sprayed 1949 - 1955	3,840,000 Ac.

BASED ON COOPERATIVE AERIAL AND GROUND SURVEYS
coordinated by
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

FIGURE 1 - PROGRESS OF SPRUCE BUDWORM EPIDEMIC IN OREGON AND WASHINGTON, 1944-57



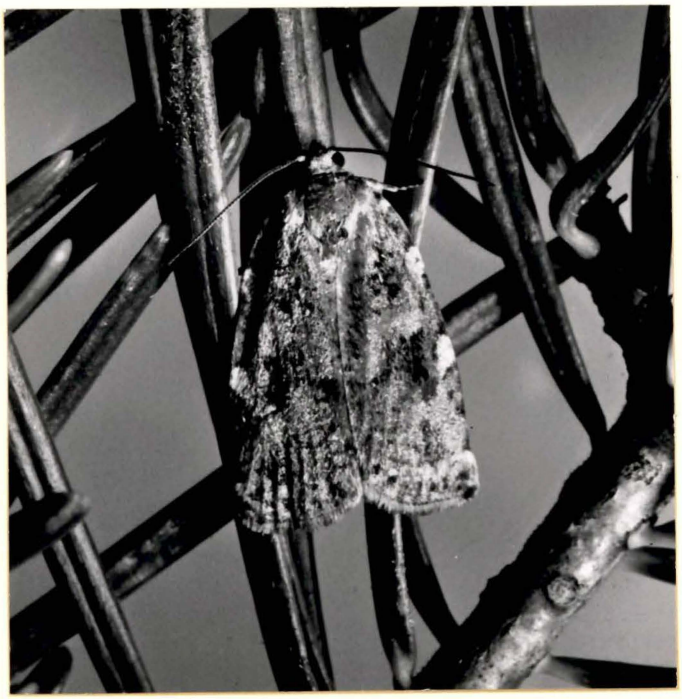
USDA-SCS PORTLAND, OREG. 1957

LIFE STAGES OF SPRUCE BUDWORM

Egg masses on underside of Douglas-fir needles (X 4).

Mature Larva (X 4).

Pupa (X 5).



Adult on true fir needles (X 3.5).

DEFOLIATION

Young fir trees defoliated by the spruce budworm. Douglas-fir and true firs of all ages are attacked. Over a period of years, defoliation by the budworm will kill trees outright, causing a loss of timber values and creating a serious forest fire hazard. Lesser defoliation causes top-killing and resulting defect; cuts forest yield by reducing tree growth; and, by weakening trees, makes them susceptible to bark beetles.

CHEMICAL CONTROL

Biologist collecting budworm larvae to determine start of spraying.

Briefing spray pilot on blocks ready for treatment.

Examining dyed cards from sprayed areas to check amount and distribution of spray.

Weatherman recording weather data to determine when to stop spraying operations for the day.

SPRAYING

Spectacular, highly effective, low-level application of DDT insecticide has prevented widespread destruction of valuable fir timber re-

NATURAL CONTROL

Spraying is an emergency measure taken until natural control is restored, hence determining the status of natural control factors is an essential part of control planning.

Left - Biologists examining infested branches to obtain basic information for sampling budworm populations.

Right - Cutting sample twigs with a pole pruner to measure budworm numbers and to determine the importance of natural control.